EXPRESS TERMS
FOR
PROPOSED BUILDING STANDARDS
OF THE
OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT

REGARDING PROPOSED CHANGES TO
2007 CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE
CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 1

LEGEND FOR EXPRESS TERMS
1. Existing California amendments or code language being modified: All such language appears in *italics*, modified language is underlined.
2. New California amendments: All such language appears *underlined and in italics*.
3. Repealed text: All such language appears in ~~strikeout~~.

EXPRESS TERMS

Title 24, Part 1

ADMINISTRATIVE REGULATIONS FOR THE
OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT (OSHPD)

CHAPTER 6. SEISMIC EVALUATION PROCEDURES FOR HOSPITAL BUILDINGS

Article 1. Definitions and Requirements

1.0 Scope. The regulations in this article shall apply to the administrative procedures necessary to implement the seismic retrofit requirements of the Alfred E. Alquist Hospital Facilities Seismic Safety Act of 1983.

1.1 Application. The regulations shall apply to all general acute care hospital facilities as defined in Section 1.2 of these regulations.

1.2 Definitions. Unless otherwise stated, the words and phrases defined in this section shall have the meaning stated therein throughout Chapter 6, Part 1, Title 24.
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Complete Structural Damage *means significant portion of the structural elements have exceeded their ultimate capacities or some critical structural elements or connections have failed resulting in dangerous permanent lateral displacement, partial collapse or collapse of the entire building. A Complete Structural Damage would be a loss of 100% of the building's replacement cost.*
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Probability of Collapse *means the fraction of building that is expected to collapse given that the ground motions defined in Section 1.4.5.1.2.1.4 occur at the building site.*

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Significant Structural Deficiency *means an attribute of the structure considered to be significant with respect to Probability of Collapse.*

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1.3 Seismic Evaluation. All general acute care hospital owners shall perform a seismic evaluation on each hospital building in accordance with the Seismic Evaluation Procedures as specified in Articles 2 through 11 of these regulations. By January 1, 2001, hospital owners shall submit the results of the seismic evaluation to the Office for review and approval. By completing this seismic evaluation, a hospital facility can determine its respective seismic performance categories for both the Structural Performance Category (SPC) and the Nonstructural Performance Category (NPC) in accordance with Articles 2 and 11 of these regulations.

1.3.1 Seismic Evaluation Submittal. Hospital owners shall submit the seismic evaluation report to the Office by January 1, 2001. There are no provisions for submittal of the evaluation report after this date, *except as provided in Section 1.4.5.1.2.* The hospital owners shall submit the evaluation report in accordance with Section 7-113, "Application for Plan, Report, or Seismic Compliance Extension Review" and Section 7-133, "Fees" of Article 3, Chapter 7, Part 1, Title 24.

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1.3.3 Structural Evaluation Report. The structural evaluation report shall include the following elements:

1. A description of the building, including photographs of the building, and sketches of the lateral force resisting system;
2. The "General Sets of Evaluation Statements" from the Appendix;
3. A synopsis of the investigation and supporting calculations that were made;
4. A list of the deficiencies requiring remediation to change statement responses from false to true; and
5. The SPC for the building, with comments on the relative importance of the deficiencies.

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1.4.5.1 Change in Seismic Performance Category. The SPC or NPC for a hospital building may be changed by the Office from the initial determination in Sections 1.3.3 or 1.3.4 provided the building has been modified to comply with the requirements of Chapter 34A, Part 2 of Title 24 for the specified SPC or NPC. *The SPC of a hospital building may also be changed by the Office on the basis of collapse probability assessments in accordance with Section 1.4.5.1.2.*

1.4.5.1.1 – The SPC or NPC for a hospital building may be changed by the Office from the initial determination made per Sections 2.0.1.2.3 or 11.0.1.2.1 upon the following:

1. A Seismic Evaluation Report shall be submitted and approved which shall include either or both of the following:
    - 1.1 A structural evaluation report in accordance with Section 1.3.3;
    - 1.2 A nonstructural evaluation report in accordance with Section 1.3.4.

      EXCEPTION: To change an NPC 1 hospital building to an NPC 2 under this section, the nonstructural evaluation may be limited in scope to the systems and equipment specified in Section 11.2.1.
2. The building has been modified to comply with the requirements of Chapter 34A, Part 2 of Title 24 for the specified SPC or NPC.

1.4.5.1.2 *Hospital buildings with an SPC 1 rating, may be reclassified to SPC 2 by the Office, pursuant to Table 2.5.3, on the basis of a collapse probability assessment provided the hospital buildings received an extension to the January 1, 2008, compliance deadline in accordance with Section 1.5.2.*

EXCEPTION*: Hospital buildings with the following deficiencies are not eligible for reclassification:*

a) The potential for surface fault rupture and surface displacement at the building site is present (Section 9.3.3).

b) Buildings with unreinforced masonry bearing wall construction (Section 5.4).

1.4.5.1.2.1 *The collapse probability assessment by the Office shall be determined using the following:*

1. Multi-Hazard Loss Estimation Methodology, Earthquake Module (HAZUS-MH MR 2) developed by the Federal Emergency Management Agency (FEMA) / National Institute of Building Sciences (NIBS).

2. Building specific input parameters required by the Advanced Engineering Building Module (AEBM) of the HAZUS methodology, shall be obtained from the Appendix H to Chapter 6.

3. Modifications by the Office to the AEBM input parameters are hereby adopted as shown in the Appendix H to Chapter 6, which are based on the following:

a) Building type

b) Building height and number of stories

c) Building age

d) Significant Structural Deficiencies listed in Section 1.4.5.1.2.2.2.2.

4. Site seismicity parameters adjusted for soil type, as determined by the Office, shall be the lesser of:

a) Deterministic ground motion due to the maximum magnitude earthquake event on the controlling fault system.

b) Probabilistic ground motion having 10% probability of being exceeded in 50 years.

1.4.5.1.2.2 *Hospital buildings with SPC 1 rating may be reclassified as follows:*

1. The Office shall issue a written notice to the hospital owners informing them that they may be eligible for reclassification of their SPC 1 buildings as permitted by Section 1.4.5.1.2.

2. For a building to be considered for reclassification, the hospital owner shall submit the following by July 1, 2009:

2.1 A complete seismic evaluation of the building pursuant to Section 1.3.3.

EXCEPTION: *Hospital owners who had submitted a complete structural evaluation report in compliance with Section 1.3.3, that is deemed to be complete by the Office, need not resubmit.*

2.2 A supplemental evaluation report prepared by a California registered structural engineer that identifies the existence or absence of the building structural Lateral Force Resisting System (LFRS) properties and Significant Structural Deficiencies listed below:

a. Age: Year of the California Building Code (CBC) used for the original building design.

EXCEPTION: *For pre-1933 buildings, the design year shall be reported.*

b. Materials Tests: Office approved materials test results based on test plan pre-approved by the Office (Section 2.1.2).

c. Mass irregularity (Section 3.3.4).

d. Vertical discontinuity (Section 3.3.5),

e. Short captive column (Section 3.6).

f. *Material deterioration (Section 3.7).*

g. *Weak columns (Sections 4.2.8 & 4.3.6).*

h. *Wall anchorage (Section 8.2).*

i. *Redundancy (Section 3.2).*

j. *Weak story irregularity (Section 3.3.1).*

k. *Soft story irregularity (Section 3.3.2).*

l. *Torsional irregularity (Section 3.3.6).*

m. *Deflection incompatibility (Section 3.5).*

n. *Cripple walls (Section 5.6.4).*

o. *Topping slab missing (Sections 7.3 & 7.4) or the building type (structural system) is of lift slab construction.*

This supplemental evaluation report shall include supporting documentation relating to the existence or absence of the Significant Structural Deficiencies listed above including calculations, where required, for review and acceptance by the Office, unless they are included in the complete structural evaluation.

2.3 Building systems shall be classified as to their Model Building Type per Table 1.4.5.1. For buildings with multiple building types, all types shall be listed. The building type resulting in the maximum collapse probability will be utilized by the Office to determine eligibility for reclassification.

Table 1.4.5.1: Model Building Type

Model Building Type (MBT)	Description
W1	Wood, Light Frame (≤ 5,000 sq. ft.)
W2	Wood, Greater than 5,000 sq.ft.
S1	Steel Moment Frame
S2	Steel Braced Frame
S3	Steel Light Frame
S4	Steel Frame with Cast-In Place Concrete Shear Walls
S5	Steel Frame with Un-reinforced Masonry Infill Walls
C1	Concrete Moment Frame
C2	Concrete Shear Walls
C3	Concrete Frame with Un-reinforced Masonry Infill Walls
PC1	Pre-cast Concrete Tilt-Up Walls
PC2	Precast Concrete Frames with Concrete Shear Walls
RM1	Reinforced-masonry Bearing Walls with Wood or Metal Deck Diaphragms
RM2	Reinforced-masonry Bearing Walls with Concrete Diaphragms
URM	Unreinforced masonry Bearing Walls
MH	Manufactured Housing

2.4 Building height and number of stories above and below the seismic base shall be specified.

1.4.5.1.2.3 *Upon assessment of the collapse probability of the SPC-1 building, the Office shall notify the hospital owner in writing the final SPC rating of the subject building.*

1.4.5.1.2.4 *When the collapse probability assessment by the Office results in the building remaining in SPC 1, further evaluation may be provided by the hospital owner in accordance with Section 2.7 in order to substantiate a higher SPC rating.*

~~**1.4.5.1.2**~~ ***1.4.5.1.3*** Except as provided in Section ~~1.4.5.1.3~~ *1.4.5.1.4*, a nonconforming hospital building that does not meet the structural and nonstructural requirements of Table 2.5.3 and Table 11-1 shall not provide acute care services or beds after the compliance deadlines set forth in Section 1.5.1. After these deadlines, the following shall apply.

1. A nonconforming hospital building used as a hospital outpatient clinical services building shall not be classified as a hospital building. It shall comply with the provisions of Health and Safety Code Section 129725. It shall not be subject to the requirements of Title 24, Part 1, Chapter 6.

2. A nonconforming hospital building used as an acute psychiatric hospital or multi-story skilled nursing facility or intermediate care facility shall be classified as a hospital building. However, it shall not be subject to the requirements of Title 24, Part 1, Chapter 6.

3. A nonconforming hospital building used as a single-story wood frame or light steel frame skilled nursing facility or intermediate care facility shall not be classified as a hospital building, and shall not be subject to the requirements of Title 24, Part 1, Chapter 6.

4. A nonconforming hospital building used for purposes other than those listed above shall not be classified as a hospital building; shall not be licensed pursuant to Health and Safety Code Section 1250(a); shall not be subject to the requirements of Title 24, Part 1, Chapter 6; and shall not be under the jurisdiction of the Office.

~~**1.4.5.1.3**~~ ***1.4.5.1.4*** A hospital building from which acute care services and beds have been removed shall not provide such services unless it has been modified to comply with the requirements of SPC 5 and NPC 4 or 5. Prior to use for acute care service, the SPC and/or NPC of the hospital building shall be changed in accordance with Section 1.4.5.1.1.

1.5 Compliance Requirements All general acute care hospital owners shall comply with the seismic performance categories, both SPCs and NPCs, established in the seismic evaluation procedures, Articles 2 and 11 and set forth in Tables 2.5.3 and 11.1 respectively.

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ARTICLE 2
PROCEDURES FOR STRUCTURAL EVALUATION OF BUILDINGS

2.0 GENERAL

2.0.1 STRUCTURAL EVALUATION PROCEDURE

1. The structural evaluation process shall include the following steps:

    1. Site visit and data collection;

    2. Identification of building type;

    3. Completion of evaluation statements in appendix;

    4. Follow-up field work, if required;

    5. Follow-up analysis for “False” evaluation statements;

6. Final evaluation for the building;

7. Preparation of the evaluation report, and

8. Submittal of evaluation report to OSHPD.

2. A general acute care hospital facility building may be exempted from a structural evaluation upon submittal of a written statement by the hospital owner to OSHPD certifying the following conditions:

    1. A conforming building as defined in Article 1, Section 1.2, may be placed into SPC 5 in accordance with Table 2.5.3 under of the following circumstances:
        a. The building was designed and constructed to the 1989 or later edition of Part 2, Title 24, and
        b. If any portion of the structure, except for the penthouse, is of steel moment resisting frame construction (Building Type 3, or Building Types 4 or 6 with dual lateral system, as defined in Section 2.2.3) and the building permit was issued after October 25, 1994.
    2. All other conforming buildings as defined in Article 1, Section 1.2, may be placed into SPC 4 in accordance with Table 2.5.3, except those required by Section 4.2.10 to be placed in SPC 3 in accordance with Table 2.5.3, without the need for any structural evaluation.
    3. Nonconforming buildings as defined in Article 1, Section 1.2 may be placed into SPC 1 in accordance with Table 2.5.3 without any structural evaluation.

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2.1.2 DATA COLLECTION

Building information pertinent to a structure's seismic performance, including condition, configuration, detailing, material strengths, and foundation type, shall be obtained in accordance with this section, and documented on drawings and/or sketches that shall be included with the structural calculations.

EXCEPTION: *Materials testing is not required for reclassification by the collapse probability assessment option as permitted by Section 1.4.5.1.2, where non-availability of materials test is identified as a deficiency per Section 1.4.5.1.2.2.2.2 (b).*

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2.5.3 FINAL EVALUATION

The final evaluation will place the building in the appropriate the SPC (Table 2.5.3), based on a review of the qualitative and quantitative results of the procedures and the list of deficiencies. In general, an unmitigated "false" answer to an evaluation statement will lower the SPC of the Building. A "false" evaluation statement may be considered mitigated if the building, element or components justified using the procedure outlined in the evaluation statement, or the effects of the condition are incorporated in the overall evaluation, as described in Section 2.5.2.2. *Alternatively, the SPC rating of a building may be assigned by the Office on the basis of a collapse probability assessment performed in accordance with Section 1.4.5.1.2.*

TABLE 2.5.3
STRUCTURAL PERFORMANCE CATEGORIES (SPC)

SPC	Description
SPC 1	Buildings posing a significant risk of collapse and a danger to the public. These buildings must be brought up to the SPC 2 level by January 1, 2008 or be removed from acute care service. *Where the office has performed a collapse probability assessment, buildings with Probability of Collapse*

	greater than 0.75% shall be placed in this category.
SPC 2	Buildings in compliance with the pre-1973 California Building Standards Code or other applicable standards, but not in compliance with the structural provisions of the Alquist Hospital Facilities Seismic Safety Act. These buildings do not significantly jeopardize life, but may not be repairable or functional following strong ground motion. These buildings must be brought into compliance with the structural provisions of the Alquist Hospital Facilities Seismic Safety Act, its regulations, or its retrofit provisions by January 1, 2030 or be removed from acute care service. *Where the office has performed a collapse probability assessment, buildings with Probability of Collapse less than or equal to 0.75% shall be placed in this category.*
SPC 3	Buildings in compliance with the structural provisions of the Alquist Hospital Facilities Seismic Safety Act, utilizing steel moment resisting frames in regions of high seismicity as defined in Section 4.2.10 and constructed under a permit issued prior to October 25, 1994. These buildings may experience structural damage which does not significantly jeopardize life, but may not be repairable or functional following strong ground motion. Buildings in this category will have been constructed or reconstructed under a building permit obtained through OSHPD. These buildings may be used to January 1, 2030 and beyond.
SPC 4	Buildings in compliance with the structural provisions of the Alquist Hospital Facilities Seismic Safety Act, but may experience structural damage which may inhibit ability to provide services to the public following strong ground motion. Buildings in this category will have been constructed or reconstructed under a building permit obtained through OSHPD. These buildings may be used to January 1, 2030 and beyond.
SPC 5	Buildings in compliance with the structural provisions of the Alquist Hospital Facilities Seismic Safety Act, and reasonably capable of providing services to the public following strong ground motion. Buildings in this category will have been constructed or reconstructed under a building permit obtained through OSHPD. These buildings may be used without restriction to January 1, 2030 and beyond.

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2.7 ALTERNATIVE ANALYSIS

The owner of a building may elect to perform an Alternative Analysis, to evaluate a structure in more detail than that provided by the evaluation procedures specified in these regulations. The methodology of an Alternative Analysis must be approved in advance by OSHPD, and shall meet the following criteria:

1. Data collection on the structure and site conditions shall be performed in accordance with the appropriate Sections of Article 2 of these regulations. Depending upon the type of analysis to be performed, additional data regarding the as built condition and material properties may be required;

2. The Alternative Analysis shall be based on a site specific ground motion as specified in Section 3413A.1.2 of the 2007 California Building Code (CBC);

3. The analysis of the structure shall determine the distribution of strength and deformation demands produced by the design ground shaking and other seismic hazards. The analysis shall address seismic demands and capacities to resist these demands for all elements in the structure that either:

   - Are essential to the lateral stability of the structure (primary elements); or

   - Are essential to the vertical load carrying integrity of the building.

4. The analysis procedure may consist of a linear or nonlinear analysis. The analytical methods and acceptance criteria shall conform to Section 3403A.2.3.4 of the 2007 CBC and nonlinear time history analysis procedure shall be reviewed and approved, in advance, by OSHPD.

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APPENDIX H TO CHAPTER 6

HAZUS AEBM REGULATIONS

***6-A1 HAZUS AEBM Technology**. The Federal Emergency Management Agency (FEMA)/National Institute of Building Sciences (NIBS) Multi-Hazard Loss Estimation Technology (HAZUS-MH MR2) and, specifically, the HAZUS Advanced Engineering Building Module (AEBM) are used by the Office with building-specific parameters, described in this appendix, to evaluate the Probability of Collapse of SPC-1 buildings.*

***6-A2 Probability of Collapse**. The Probability of Collapse, P[COL], is calculated by Equation (A6-1):*

$$P[COL] = P[COL|STR_5] \times P[STR_5] \qquad \text{(A6-1)}$$

Where:

$P[COL|STR_5]$ = *collapse factor of the HAZUS AEBM, as modified herein, and*

$P[STR_5]$ = *probability of Complete Structural Damage, based on HAZUS AEBM methods and parameters, as modified herein.*

***6-A3 Building-Specific Properties**. Building-specific properties are based on the building type (structural system), or Model Building Type (MBT), building height (number of stories above seismic base), building age (pre-1933, 1933 – 1961 or post-1961 design vintage), availability of materials testing data, and Significant Structural Deficiencies.*

Table A6-1 lists Significant Structural Deficiencies. Table A6-1 includes older buildings (pre-1933 buildings) and buildings that do not have available materials test data, and treats these conditions as Significant Structural Deficiencies.

SPC-1 buildings with no Significant Structural Deficiencies are evaluated using "Baseline" values of building-specific properties. SPC-1 buildings with one or more, Significant Structural Deficiencies are evaluated using sub-baseline (SubBase), or ultra-sub-baseline (USB) building-specific properties, as specified in Table A6-1.

Building-specific properties include parameters related to (1) building capacity, (2) building response, (3) Complete Structural Damage, and (4) building collapse. Appendix H Sections 6-A4 through 6-A7, define the parameters of interest related to building capacity, building response, Complete Structural Damage and building collapse, respectively, and specify appropriate values of these parameters.

***6-A4. Building Capacity**. Building-specific capacity properties of interest include the yield capacity control point (D_y, A_y) and the ultimate capacity control point (D_u, A_u), as calculated by Equations (A6-2 through A6-5, respectively):*

$$A_y = C_s \cdot \gamma / \alpha_1 \qquad \text{(A6-2)}$$

$$D_y = 9.8 \cdot A_y \cdot T_e^{\,2} \qquad \text{(A6-3)}$$

$$A_u = \lambda \cdot A_y \qquad \text{(A6-4)}$$

$$D_u = \lambda \cdot \mu \cdot D_y \qquad \text{(A6-5)}$$

Where:

C_s = *seismic design coefficient - values of C_s are given in Tables A6-2a and Table A6-2b, respectively,*
α_1 = *modal weight factor, Alpha 1 - values of α_1 are given in Table A6-4,*
T_e = *elastic period, in seconds - values of T_e are given in Table A6-3,*
γ = *yield strength factor, Gamma - values of γ are given in Table A6-5,*
λ = *"overstrength" factor, Lambda - values of λ are given in Table A6-5, and*
μ = *"ductility" factor, Mu - values of μ are given in Table A6-6.*

***6-A5 Building Response**. Building-specific response parameters of interest include the elastic damping factor, β_E, and the degradation factor, Kappa. Values of β_E are given in Table A6-7 and values of the Kappa factor are given in Table A6-8.*

***6-A-6 Complete Structural Damage**. Building-specific damage parameters of interest include the median spectral displacement of the Complete Structural Damage state, $S_{d,C}$, and the associated lognormal standard deviation (Beta) factor, β_C. Values of β_C are given in Table A6-11. Median spectral displacement at the Complete Structural Damage state, $S_{d,C}$, is calculated using Equation (A6-6):*

$$S_{d,C} = \Delta_C \cdot H_R \cdot \alpha_2 / \alpha_3 \qquad \text{(A6-6)}$$

Where:

- Δ_C = *inter-story drift ratio (of the story with maximum drift) at the threshold of Complete Structural Damage - values of Δ_C are given in Table A6-9,*
- H_R = *height of building at the roof level, in inches - default values of H_R are given in Table A6-3 as a function of the number of stories above grade,*
- α_2 = *modal height factor, Alpha 2 - values of α_2 are given in Table A6-4, and*
- α_3 = *modal shape factor, Alpha 3, relating maximum-story drift and roof drift, values of α_3 are given in Table A6-10.*

***6-A-7 Building Collapse**. Building-specific values of the collapse factor, $P[COL|STR_5]$, that describe the fraction of the building likely to be collapsed given that the building has reached the Complete Structural Damage state, STR_5, are given in Table A6-12.*

Table A6-1 Significant Structural Deficiency Matrix

Significant Structural Deficiency/Condition[1]	Capacity		Response		Complete Structural Damage State						Collapse	
	Over-Strength		Duration		Fragility Curve Median[4]				Fragility Curve Variability - Beta Factor (β_C)		Collapse Factor ($P[COL\|STR_5]$)	
	Gamma and Lambda Factors		Degradation (Kappa) Factor		Maximum Story Drift Ratio (Δ_C)		Mode Shape (Alpha 3) Factor					
	SubBase	USB	SubBase	USB[5]	SubBase	USB	SubBase	USB[6]	SubBase	USB[5]	SubBase	USB[6]
Age (Pre-1933 buildings)	X	X[7]										
Materials Testing (None)	X								X			
No Redundancy									X		X	X[6]
Weak Story Irregularity					X		X	X[6]			X	X[6]
Soft Story Irregularity					X		X	X[6]			X	X[6]
Mass Irregularity					X							
Vertical Discontinuity	X				X							
Torsional Irregularity						X					X	X[6]
Deflection Incompatibilty[2]					X				X		X	X[6]
Short Column[3]	X					X						
Wood Deterioration		X	X									
Steel Deterioration		X	X									
Concrete Deterioration		X	X									
Weak Column-Steel	X				X							
Weak Column-Concrete	X		X		X							
No Cripple Wall Bracing					X		X	X[6]			X	X[6]
Topping Slab Missing	X		X						X		X	X[6]
Inadequate Wall Anchorage		X							X			

1. Sub-Baseline (SubBase) and Ultra-Sub-Baseline (USB) properties are based on one, or more, significant structural deficiencies.
2. The Deflection Incompatibility structural deficiency applies only to concrete systems (C1, C2 and C3).
3. The Short Column structural deficiency applies only to concrete and masonry systems (C1, C2, C3, RM1 and RM2).
4. Effects of deficiencies related to drift and mode shape limited to a combined factor of 5 reduction in Complete median (of HAZUS default value).
5. Grey shading indicates USB performance is not defined/used for deficiencies related to degradation (kappa) and fragility curve (beta) factors.
6. USB performance required for systems with multiple, SubBase deficiencies related to either the mode shape (Alpha 3) factor or the collapse rate.
7. USB performance required for pre-1933 buildings with other over-strength-related deficiencies (else use SubBase performance for pre-1933 buildings).

Table A6-2a Seismic Design Coefficient, C_s UBC Seismic Zone 4

No. of Stories	Seismic Design Coefficient, C_s - UBC Seismic Zone 4 Locations (Zone 3 of older editions of the UBC)					
	Structural System (MBT)					
	S1 and C1		S2, S3, S4, S5, C2 and C3 (MH)		W1, W2, PC1, PC2, RM1, RM2, URM	
	Post-61	Pre-61	Post-61	Pre-61	Post-61	Pre-61
1	0.072	0.109	0.100	0.109	0.133	0.109
2	0.057	0.092	0.100	0.092	0.133	0.092
3	0.050	0.080	0.086	0.080	0.114	0.080
4	0.045	0.071	0.078	0.071	0.104	0.071
5	0.042	0.063	0.073	0.063	0.098	0.063
6	0.040	0.057	0.069	0.057	0.092	0.057
7	0.038	0.052	0.066	0.052	0.088	0.052
8	0.036	0.048	0.064	0.048	0.085	0.048
9	0.035	0.044	0.062	0.044	0.082	0.044
10	0.034	0.041	0.060	0.041	0.080	0.041
11	0.032	0.039	0.058	0.039	0.078	0.039
12	0.032	0.036	0.057	0.036	0.076	0.036
13	0.031	0.034	0.056	0.034	0.074	0.034
14	0.030	0.032	0.055	0.032	0.073	0.032
15	0.029	0.031	0.054	0.031	0.072	0.031
16	0.029	0.029	0.053	0.029	0.070	0.029
17	0.028	0.028	0.052	0.028	0.069	0.028
18	0.028	0.027	0.051	0.027	0.068	0.027
19	0.027	0.026	0.051	0.026	0.067	0.026
>= 20	0.027	0.024	0.050	0.024	0.067	0.024

Table A6-2b Seismic Design Coefficient, C_s UBC Seismic Zone 3

No. of Stories	Seismic Design Coefficient, C_s - UBC Seismic Zone 3 Locations (Zone 2 - older editions of the UBC)					
	Structural System (MBT)					
	S1 and C1		S2, S3, S4, S5, C2 and C3 (MH)		W1, W2, PC1, PC2, RM1, RM2, URM	
	Post-61	Pre-61	Post-61	Pre-61	Post-61	Pre-61
1	0.036	0.055	0.050	0.055	0.066	0.055
2	0.028	0.046	0.050	0.046	0.066	0.046
3	0.025	0.040	0.043	0.040	0.057	0.040
4	0.023	0.035	0.039	0.035	0.052	0.035
5	0.021	0.032	0.037	0.032	0.049	0.032
6	0.020	0.029	0.035	0.029	0.046	0.029
7	0.019	0.026	0.033	0.026	0.044	0.026
8	0.018	0.024	0.032	0.024	0.043	0.024
9	0.017	0.022	0.031	0.022	0.041	0.022
10	0.017	0.021	0.030	0.021	0.040	0.021
11	0.016	0.019	0.029	0.019	0.039	0.019
12	0.016	0.018	0.029	0.018	0.038	0.018
13	0.015	0.017	0.028	0.017	0.037	0.017
14	0.015	0.016	0.027	0.016	0.036	0.016
15	0.015	0.015	0.027	0.015	0.036	0.015
16	0.014	0.015	0.026	0.015	0.035	0.015
17	0.014	0.014	0.026	0.014	0.035	0.014
18	0.014	0.013	0.026	0.013	0.034	0.013
19	0.014	0.013	0.025	0.013	0.034	0.013
>= 20	0.013	0.012	0.025	0.012	0.033	0.012

Table A6-3 Default Building Heights and Elastic Periods

No. of Stories	Default Building Height, H_R, and Elastic Period, T_e, Properties													
	Structural System (MBT)													
	W1 and W2 (MH)		S1		C1		S2		S4 and S5		C2, C3, PC2, RM1, RM2, URM		S3 and PC1	
	H_R (ft.)	T_e (sec.)	H_R (ft.)	T_e (sec.)	H_R (ft.)	T_e (sec.)	H_R (ft.)	T_e (sec.)	H_R (ft.)	T_e (sec.)	H_R (ft.)	T_e (sec.)	H_R (ft.)	T_e (sec.)
1	14	0.35	14	0.40	12	0.40	14	0.40	14	0.35	12	0.35	15	0.35
2	24	0.38	24	0.50	20	0.40	24	0.43	24	0.35	20	0.35	25	0.39
3	34	0.49	36	0.69	30	0.48	36	0.59	36	0.44	30	0.39	35	0.50
4	44	0.60	48	0.87	40	0.62	48	0.73	48	0.55	40	0.48		
5	54	0.70	60	1.04	50	0.76	60	0.86	60	0.65	50	0.57		
6			72	1.20	60	0.89	72	0.99	72	0.74	60	0.65		
7			84	1.36	70	1.03	84	1.11	84	0.84	70	0.73		
8			96	1.51	80	1.16	96	1.22	96	0.92	80	0.81		
9			108	1.66	90	1.29	108	1.34	108	1.01	90	0.88		
10			120	1.81	100	1.41	120	1.45	120	1.09	100	0.95		
11			132	1.95	110	1.54	132	1.55	132	1.17	110	1.02		
12			144	2.09	120	1.67	144	1.66	144	1.25	120	1.09		
13			156	2.23	130	1.79	156	1.76	156	1.33	130	1.16		
14			168	2.36	140	1.91	168	1.86	168	1.40	140	1.23		
15			180	2.50	150	2.04	180	1.96	180	1.48	150	1.29		
16			192	2.63	160	2.16	192	2.06	192	1.55	160	1.35		
17			204	2.76	170	2.28	204	2.15	204	1.62	170	1.42		
18			216	2.89	180	2.40	216	2.25	216	1.70	180	1.48		
19			228	3.02	190	2.52	228	2.34	228	1.77	190	1.54		
>= 20			240	3.14	200	2.64	240	2.43	240	1.84	200	1.60		

Table A6-4 Alpha 1 and Alpha 2, Modal Factors

No. of Stories	Alpha 1 (α_1) - Modal Weight Factor				Alpha 2 (α_2) - Modal Height Factor	
	Structural System (MBT)				Structural System (MBT)	
	S1 and C1	W1, W2, S2, S3, S4, C2, C3, PC2, RM1 and RM2	PC1 and URM	MH	MH	All Systems (except MH)
1	0.75	0.8	0.75	1.00	1.00	0.75
2	0.75	0.8	0.75			0.75
3	0.75	0.8	0.75			0.75
4	0.75	0.8				0.75
5	0.75	0.8				0.75
6	0.73	0.79				0.72
7	0.71	0.78				0.69
8	0.69	0.77				0.66
9	0.67	0.76				0.63
10	0.65	0.75				0.60
11	0.65	0.75				0.60
12	0.65	0.75				0.60
13	0.65	0.75				0.60
14	0.65	0.75				0.60
>= 15	0.65	0.75				0.60

Table A6-5 Lambda Factor

No. of Stories	Gamma Factor (γ)	Lambda Factor (λ)														
		Baseline Performance					SubBase Performance					USB Performance				
		Structural System (MBT)					Structural System (MBT)					Structural System (MBT)				
		W1, S1, C1	W2, C2	S4, C3	Other MBT	PC1, URM	W1, S1, C1	W2, C2	S4, C3	Other MBT	PC1, URM	W1, S1, C1	W2, C2	S4, C3	Other MBT	PC1, URM
1	2.70	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
2	2.50	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
3	2.25	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
4	2.00	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
5	1.88	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
6	1.80	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
7	1.75	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
8	1.71	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
9	1.69	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
10	1.67	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
11	1.65	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
12	1.65	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
13	1.65	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
14	1.65	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17
>= 15	1.65	2.00	2.00	1.83	1.67	1.33	1.75	1.75	1.63	1.50	1.25	1.50	1.50	1.42	1.33	1.17

Table A6-6 Ductility Factor Mu

No. of Stories	Mu (μ) Factor (All Systems)
1	6.00
2	6.00
3	4.94
4	4.41
5	4.07
6	3.82
7	3.63
8	3.48
9	3.35
10	3.24
11	3.15
12	3.07
13	3.00
14	3.00
>= 15	3.00

Table A6-7 Elastic Damping

Structural System (MBT)	β_E Elastic Damping (% of Critical)
S1, S2, S3 and S4	5
C1, C2, PC1 and PC2	7
RM1 and RM2	7
C3 and S5	7
W1 and W2	10

Table A6-8 Degradation Kappa Factors

Scenario Earthquake Criteria		Degradation (Kappa) Factors - (κ_S, $\kappa_{M\ and}$ κ_L)			
Minimum Distance Site to Fault[1] (km)	Maximum Magnitude[2]	Baseline Performance		SubBase Performance	
		Post-61	Pre-1961	Post-61	Pre-1961
< 5	**All**	0.8	0.7	0.6	0.5
5 - 10	**M_{max} <= 6.5**	0.8	0.7	0.6	0.5
5 - 10	**M_{max} > 6.5**	0.7	0.6	0.5	0.4
10 - 25	**M_{max} <= 6.5**	0.7	0.6	0.5	0.4
10 - 25	**7.0 >= M_{max} > 6.5**	0.6	0.5	0.4	0.3
10 - 25	**M_{max} > 7.0**	0.5	0.4	0.3	0.2
25 - 50	**M_{max} <= 7.0**	0.5	0.4	0.3	0.2
25 - 50	**M_{max} > 7.0**	0.4	0.3	0.2	0.1
> 50	**All**	0.4	0.3	0.2	0.1

1. Minimum distance to the fault that controls 1-second period ground motions at the building site.
2. Maximum magnitude (Mmax) of fault that controls 1-second ground motions at the building site

Table A6-9 Interstory Drift Ratio – Median Complete Structural Damage

Structural System (MBT)	Interstory Drift Ratio (max story) - Median Complete Structural Damage (Δ_C)					
	Baseline Performance		SubBase Performance		USB Performance	
	Post-61	Pre-61	Post-61	Pre-61	Post-61	Pre-61
W1, W2	0.075	0.075	0.060	0.060	0.038	0.038
S1, C1, S2 and C2	0.060	0.050	0.050	0.040	0.030	0.025
S3, S4, PC1, PC2, RM1 and RM2	0.053	0.044	0.044	0.035	0.027	0.022
S5, C3		0.035		0.028		0.018

Table A6-10 Alpha 3 (α_3) Modal Shape Factor

No. of Stories	Alpha 3 (α_3) Modal Shape Factor - Ratio of Maximum Interstory Drift to Average Interstory Drift								
	When Combined with Baseline Interstory Drift Ratios (Table A6-9)			When Combined with SubBase Interstory Drift Ratios (Table A6-9)			When Combined with USB Interstory Drift Ratios (Table A6-9)		
	Baseline Performance	SubBase Performance	USB Performance	Baseline Performance	SubBase Performance	USB Performance	Baseline Performance	SubBase Performance	USB Performance
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	1.21	1.62	2.03	1.21	1.62	2.03	1.21	1.62	2.03
3	1.35	2.04	2.73	1.35	2.04	2.73	1.35	2.04	2.50
4	1.45	2.36	3.27	1.45	2.36	3.27	1.45	2.36	2.50
5	1.54	2.63	3.72	1.54	2.63	3.72	1.54	2.50	2.50
6	1.62	2.87	4.11	1.62	2.87	4.00	1.62	2.50	2.50
7	1.69	3.07	4.46	1.69	3.07	4.00	1.69	2.50	2.50
8	1.75	3.26	4.77	1.75	3.26	4.00	1.75	2.50	2.50
9	1.81	3.43	5.00	1.81	3.43	4.00	1.81	2.50	2.50
10	1.86	3.59	5.00	1.86	3.59	4.00	1.86	2.50	2.50
11	1.91	3.73	5.00	1.91	3.73	4.00	1.91	2.50	2.50
12	1.96	3.87	5.00	1.96	3.87	4.00	1.96	2.50	2.50
13	2.00	4.00	5.00	2.00	4.00	4.00	2.00	2.50	2.50
14	2.04	4.12	5.00	2.04	4.00	4.00	2.04	2.50	2.50
>= 15	2.08	4.23	5.00	2.08	4.00	4.00	2.08	2.50	2.50

Table A6-11 Lognormal Standard Deviation (Beta) Values – Complete Structural Damage

No. of Stories	Lognormal Standard Deviation (Beta) Values - Complete Structural Damage (β_C)			
	Baseline Performance		SubBase Performance	
	Post-61	Pre-61	Post-61	Pre-61
1	0.85	0.90	0.95	1.00
2	0.85	0.90	0.95	1.00
3	0.85	0.90	0.95	1.00
4	0.84	0.89	0.94	0.99
5	0.83	0.88	0.93	0.98
6	0.82	0.87	0.92	0.97
7	0.81	0.86	0.91	0.96
8	0.80	0.85	0.90	0.95
9	0.79	0.84	0.89	0.94
10	0.78	0.83	0.88	0.93
11	0.77	0.82	0.87	0.92
12	0.76	0.81	0.86	0.91
13	0.75	0.80	0.85	0.90
14	0.75	0.80	0.85	0.90
>= 15	0.75	0.80	0.85	0.90

Table A6-12 Collapse Factor

Structural System (MBT)	Collapse Factor - Likelihood of Collapse given Complete Structural Damage - $P[COL|STR_5]$		
	Baseline Performance	**SubBase Performance**	**USB Performance**
W1 and W2	0.05	0.10	0.20
S1, S2, S3, S4 and S5	0.08	0.15	0.30
C1, C2 and C3	0.13	0.25	0.50
RM1 and RM2	0.13	0.25	0.50
PC1 and PC2	0.15	0.30	0.60

NOTATION

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129850 & 130005(g)*